SYSTEM STUDIES FOR LARGE SCALE MULTIOBJECTIVE INTEGRATED IRRIGATION MANAGEMENT

By

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CERTIFICATE

This is to certify that the thesis entitled, 'SYSTEM STUDIES FOR LARGE SCALE MULTIOBJECTIVE INTEGRATED IRRIGATION MANAGEMENT' being submitted by Mr. Deep Kumar Gupta to the Indian Institute of Technology,Delhi,India,for the award of the degree of DOCTOR OF PHILOSOPHY, is a record of bonafide research work carried out by him under my supervision and guidance. The thesis work, in my opinion, has reached the standard, fulfilling the requirements for DOCTOR OF PHILOSOPHY degree. The research report and the results presented in this thesis have not been submitted, in part or in full, to any other University or Institute, for the award of any degree or diploma.

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ABSTRACT

This study aims to develop an approach and methodology for integrated development of the two basic environmental resource, land and water, for the purpose of irrigation/agricultural development in a region. It may form the conceptual basis for undertaking modernization of old irrigation systems.

This study is dealt through Large Scale Systems analysis. A multilevel hierarchial decomposition and model coordination based mathematical programming method using Benders (1962) partitioning procedure is developed for determining multiperiod surface water allocations amongst serially coupled canal systems at second level, with regional objectives of economic efficiency maximization, reduction in intraregional economic disparities (equity) and balanced food crop productions. At first level the canal systems (subsystems) are optimized independently. A multiperiod linear programming optimization model has been developed with conjunctive use of interconnected surface and ground water systems for first level problem. Certain policy issues have also been investigated through this model. These include crop-water-land allocations to crop production activities for multiobjectives of economic efficiency, food production and employment generation; future groundwater development with and without augmentation tubewells; water conservation through lining of one or more components of the canal system and utilization of surplus surface water during monsoon months for Kharif irrigation. It uses constraint method for multiobjective trade-off analysis.

The applicability of the approach and methodology is

demonstrated on the three existing canal systems off taking from the river Ganga, India. A trade-off between economic efficiency and equity for the region is developed by reallocation of surface water with certain food production policies. Various policy issues have been investigated through the LP subsystem model for one canal system.

Results obtained may not be of general applicability as these depend upon the present status of development of the region. Nevertheless, this study contributes to the development of methodology for exploring and investigating various issues related to irrigation management.

TABLE OF CONTENTS